CERES Flux-by-Cloud Type Simulator uUpdate

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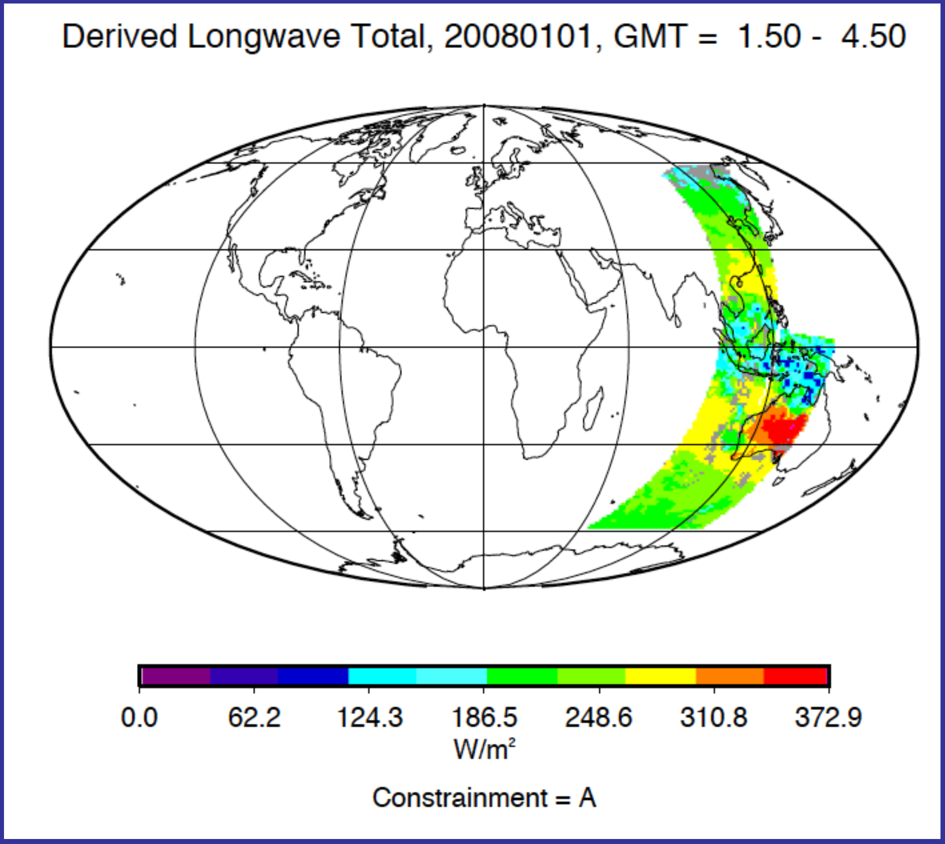
What is the Flux-by-cloud type product?

- Assigns a flux to each observed ISCCP cloud type within a region.
- For each 1° x1° region between 60° S and 60° N, each daytime footprint is placed into 1-3 p_c-τ ISCCP-like categories (3 categories would be the case of a footprint with two cloud levels as well as clear pixels).
- For the footprints with a single cloud type, the standard SSF flux is added to that p_c-τ category.
- For footprints with multiple cloud levels, narrowband-to-broadband radiance conversions are performed for each cloud level.
- Broadband radiances are converted to fluxes using ADMs.

What is a simulator?

- Put simply, a simulator is meant to replicate what a space-based instrument would measure if it flew above a GCM or other model on the temporal and spatial scales of the measurements.



Motivation for flux-by-cloud type simulator

- Cloud properties and fluxes/albedos will be matched within 1.5 hours to the closest CERES overpass, which is important because of the large diurnal cycles in cloud fraction, τ, and p_c in many areas.
- Breaking out the flux by cloud type can help isolate physical parameterizations that are problematic (e.g., convective clouds, boundary-layer parameterizations, or processes involving surface albedo), and provide a test for new parameterizations.
- Diagnoses using flux-by-cloud type combined with frequency of occurrence can also help determine whether an unrealistically small or large occurrence of a given cloud type has an important radiative impact for a given region.

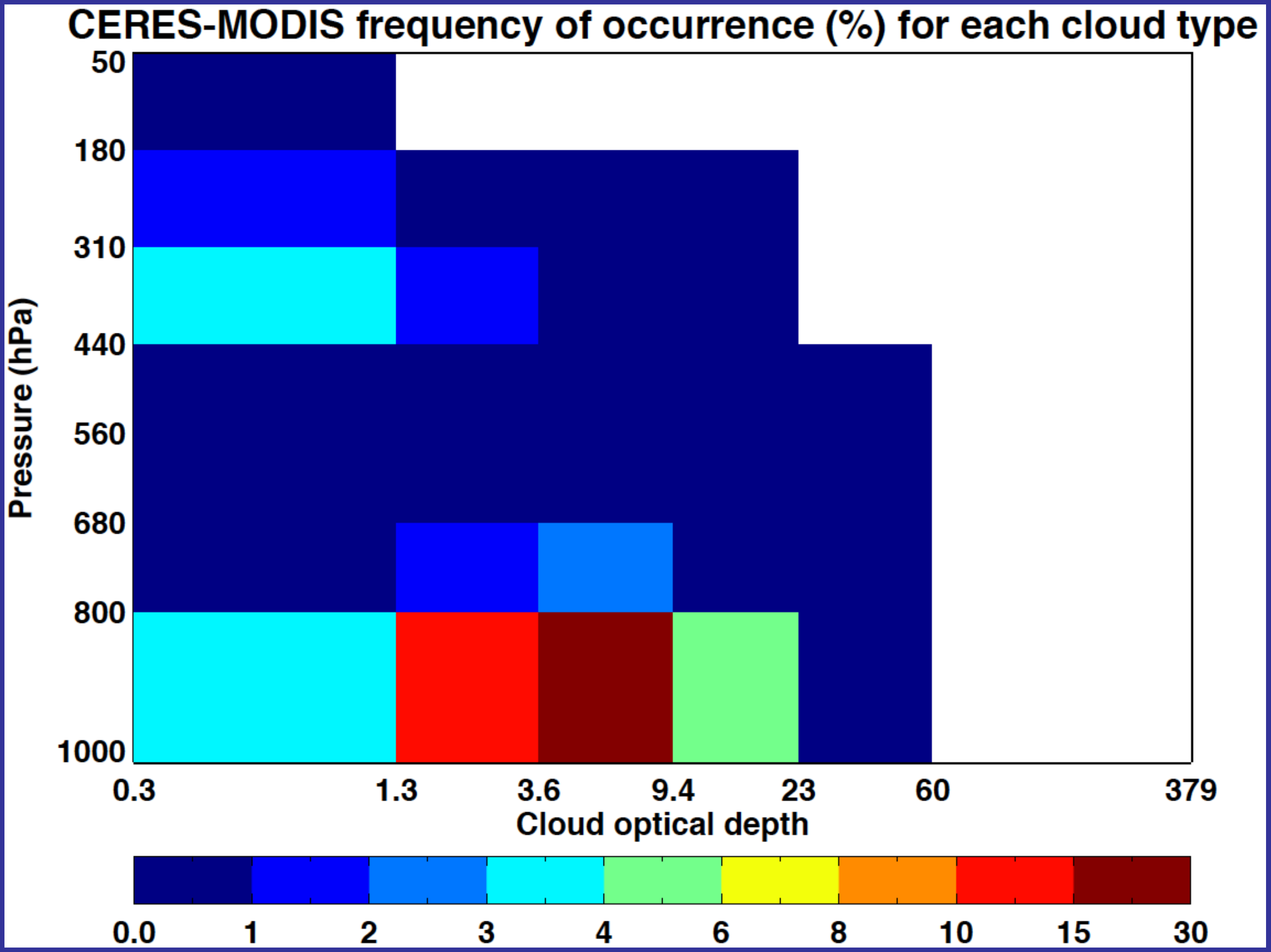
Newer Results: SE Pacific

- Gathered 1585 profiles (approx. one per day) with various cloud conditions over 10-20 S, 80-90 W.
- In the shortwave, mean outgoing SW difference (Fu-Liou – UKMO) is -5.9 W m^{-2}, and RMS difference is 17.4 W m^{-2}.
- In the longwave, mean OLR difference (Fu-Liou – UKMO) is -5.0 W m^{-2}, and RMS difference is 6.5 W m^{-2}.
- Mean albedo diff: -0.0047

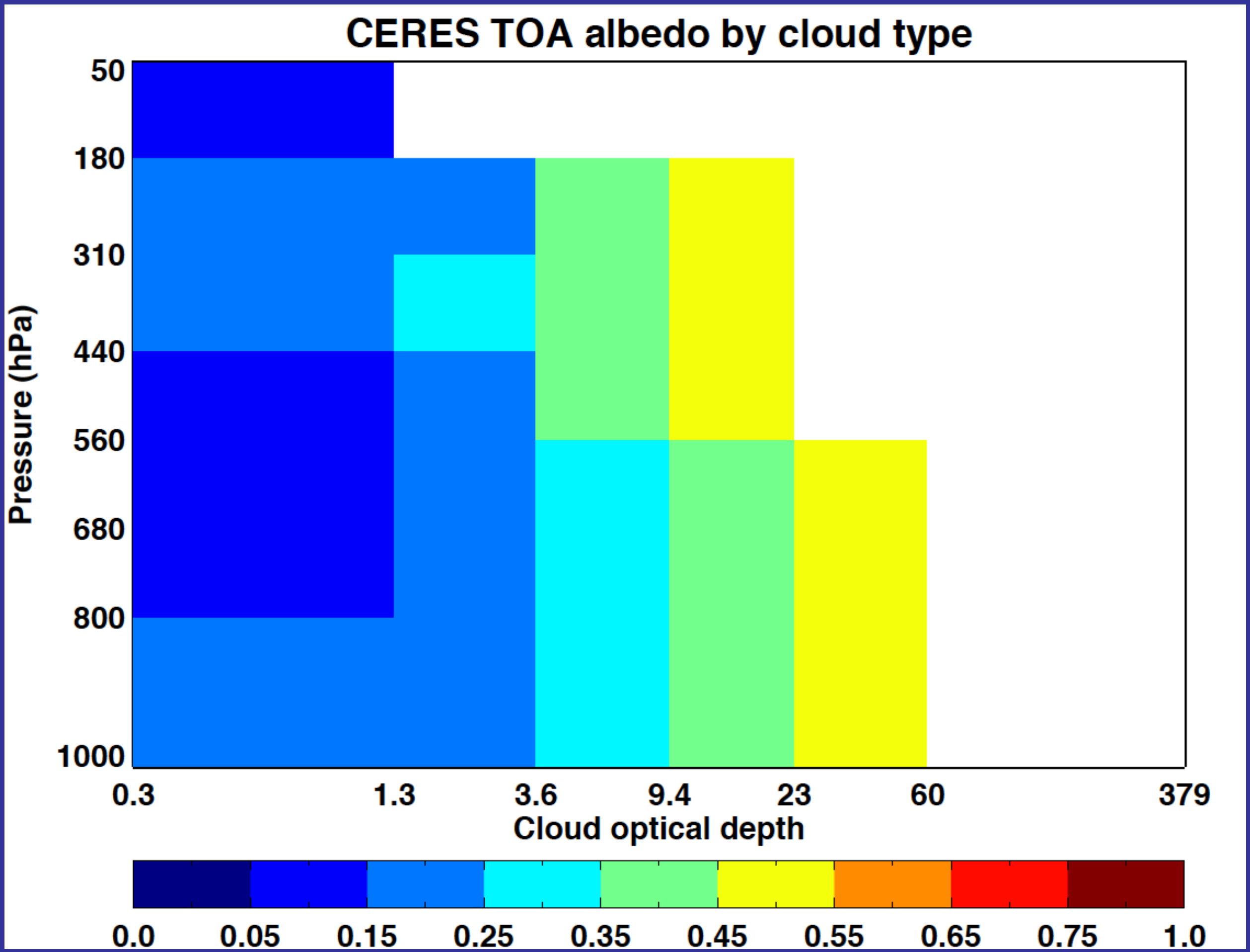
Newer Results: SE Pacific

- Observed clear fraction: 0.4224795
- Simulated clear fraction: 0.525
- Observed all-sky OLR: 272.4
- Simulated all-sky OLR: 270.4 (normalized: 275.5)
- Observed clear-sky OLR: 282.8
- Simulated clear-sky OLR: 283.6 (normalized: 289.5)
- Observed all-sky TOA albedo: 0.193
- Simulated all-sky TOA albedo: 0.184 (normalized: 0.189)
- Observed clear-sky TOA albedo: 0.093
- Simulated clear-sky TOA albedo: 0.073 (normalized: 0.074)

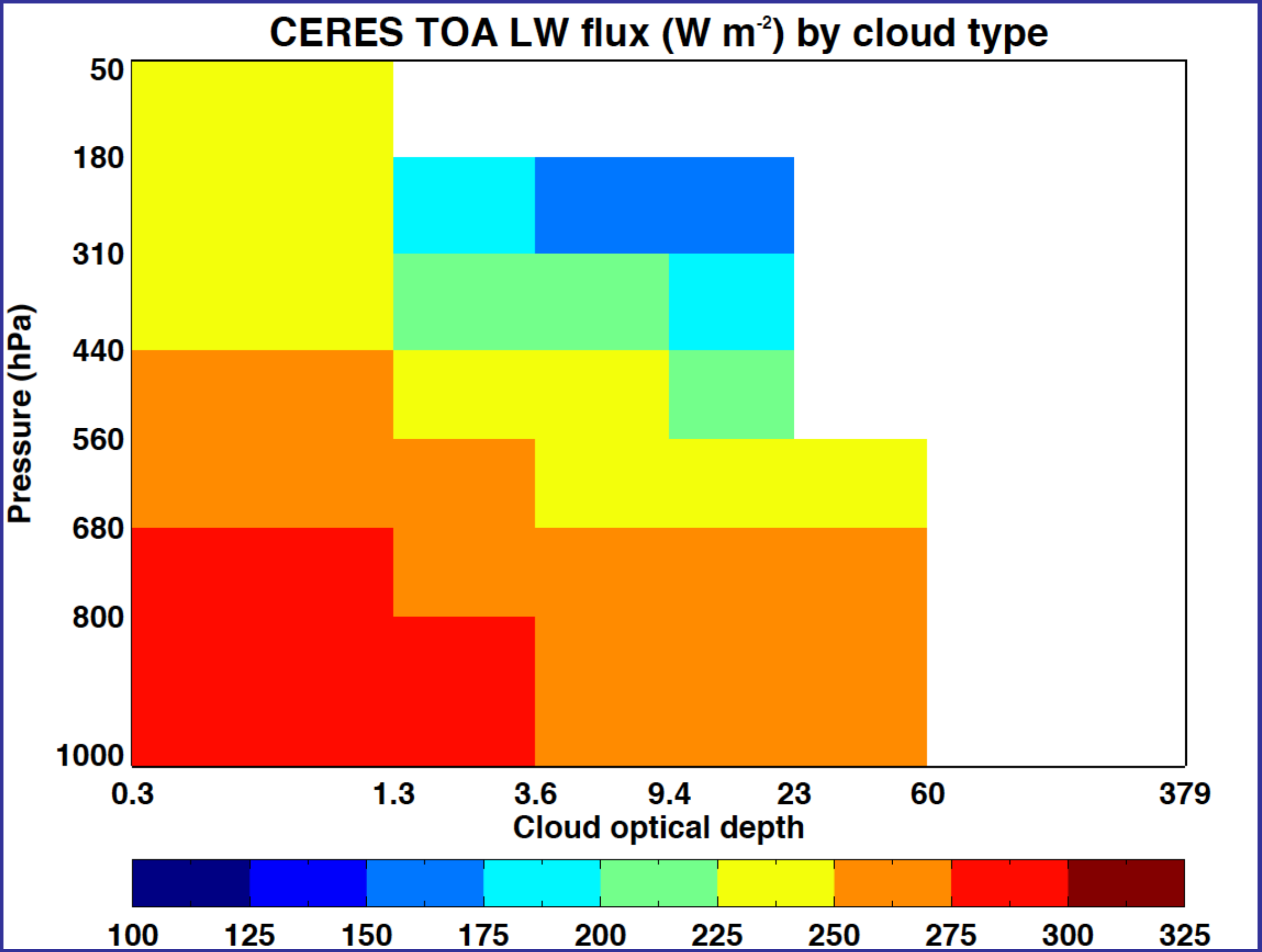
CERES FBCT Cloud Occurrence



CERES SW albedo by cloud type



CERES OLR by cloud type



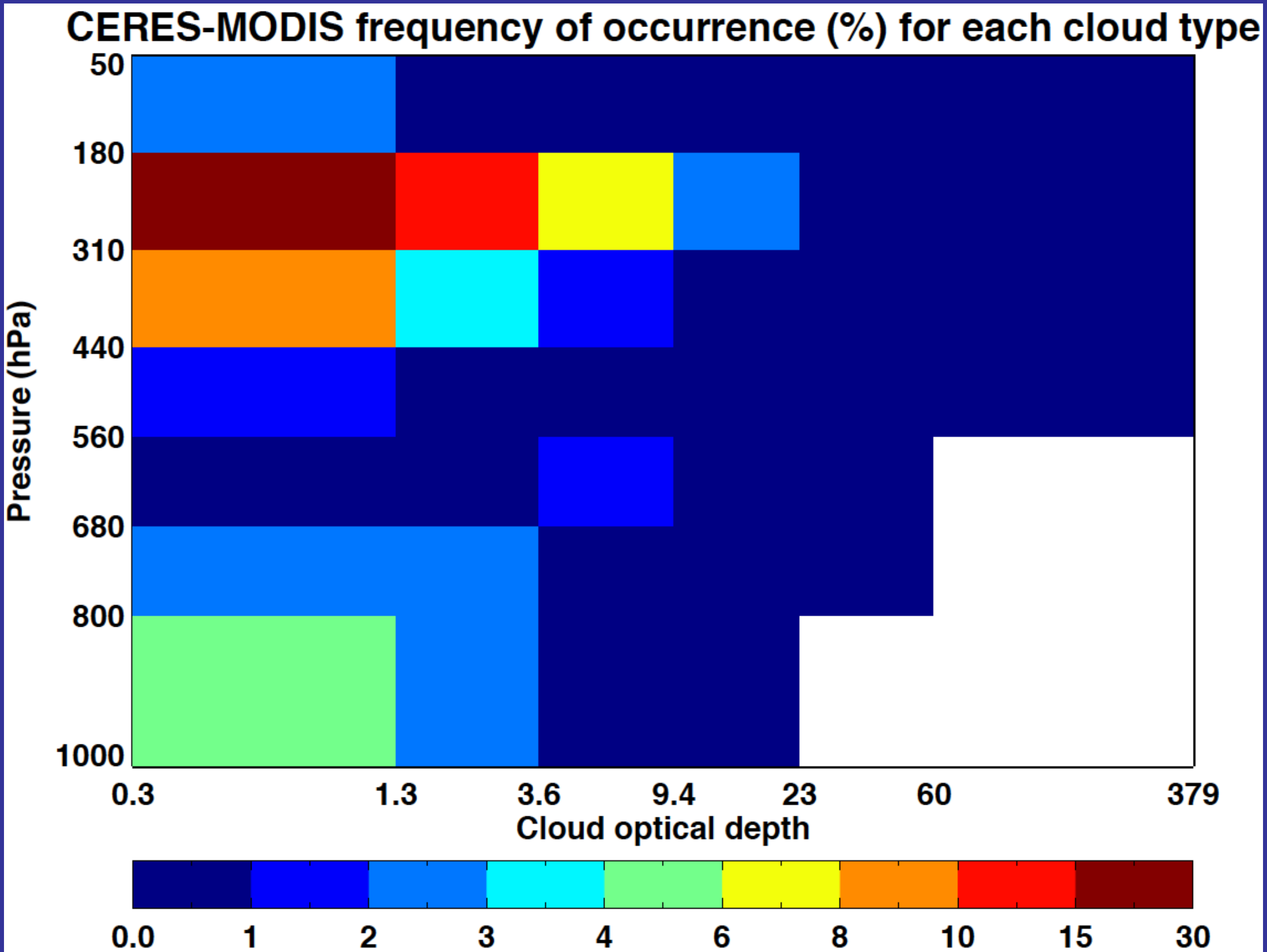
Newer Results: EQ Pacific

- Gathered 1235 profiles (approx. one per day) with various cloud conditions over 5 S – 5 N, 160-170 E.
- In the shortwave, mean outgoing SW difference (Fu-Liou – UKMO) is -3.4 W m^{-2}, and RMS difference is 19.6 W m^{-2}.
- In the longwave, mean OLR difference (Fu-Liou – UKMO) is -12.0 W m^{-2}, and RMS difference is 14.6 W m^{-2}.
- Mean albedo diff: -0.0029

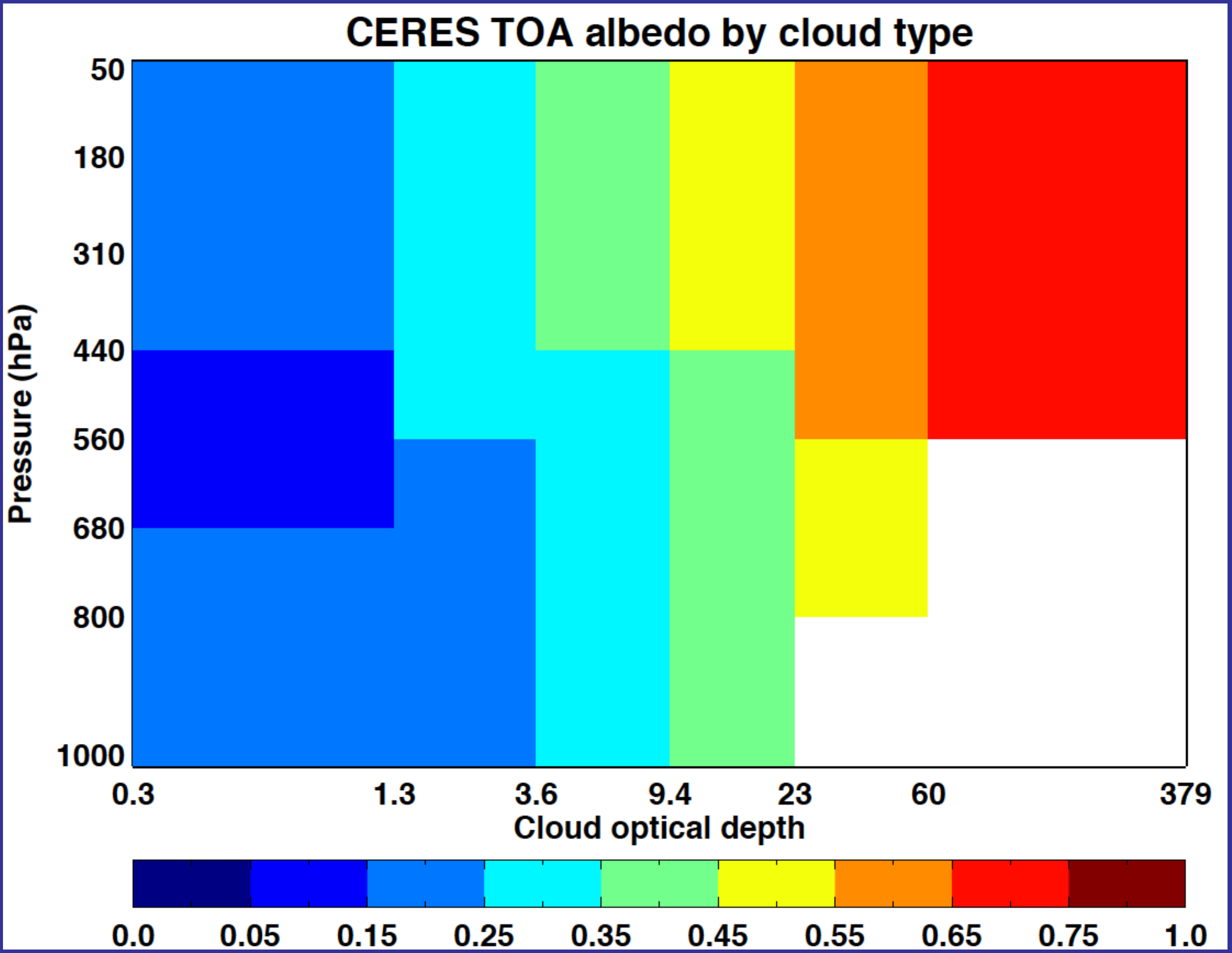
Newer Results: EQ Pacific

- Observed clear fraction: 0.2022446
- Simulated clear fraction: 0.603
- Observed OLR: 227.7
- Simulated OLR: 247.7 (normalized 260.2)
- Observed clear-sky OLR: 276.0
- Simulated clear-sky OLR: 280.6 (normalized 291.6)
- Observed TOA albedo: 0.220
- Simulated TOA albedo: 0.183 (normalized 0.186)
- Observed clear-sky TOA albedo: 0.099
- Simulated clear-sky TOA albedo: 0.079 (normalized 0.079)

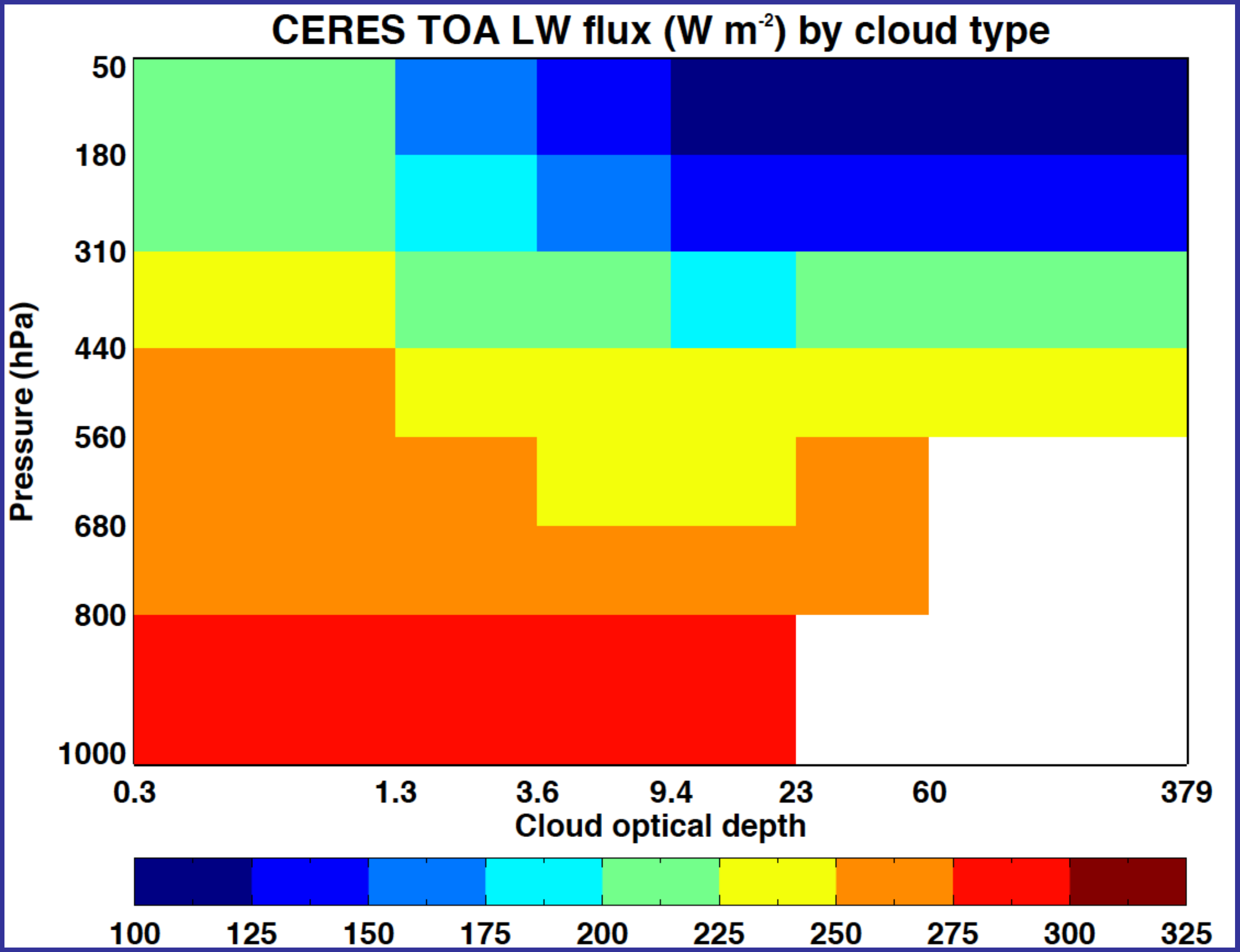
CERES FBCT Cloud Occurrence



CERES SW albedo by cloud type



CERES OLR by cloud type



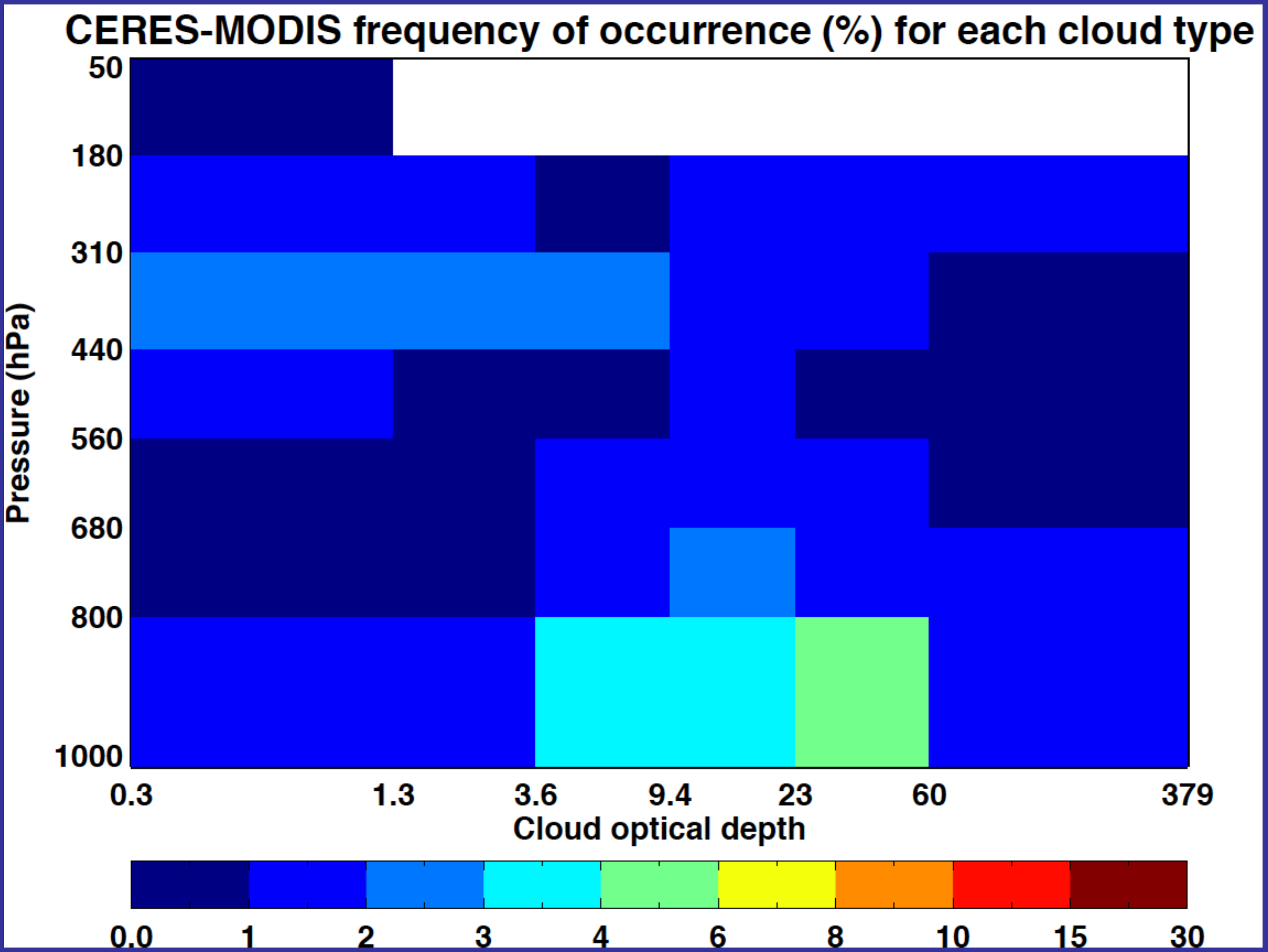
Newer Results: SGP

- Gathered 1606 profiles (approx. one per day) with various cloud conditions over 30-40 N, 90-100 W.
- In the shortwave, mean outgoing SW difference (Fu-Liou – UKMO) is 2.6 W m^{-2}, and RMS difference is 12.4 W m^{-2}.
- In the longwave, mean OLR difference (Fu-Liou – UKMO) is -3.5 W m^{-2}, and RMS difference is 6.6 W m^{-2}.
- Mean albedo diff: 0.0037

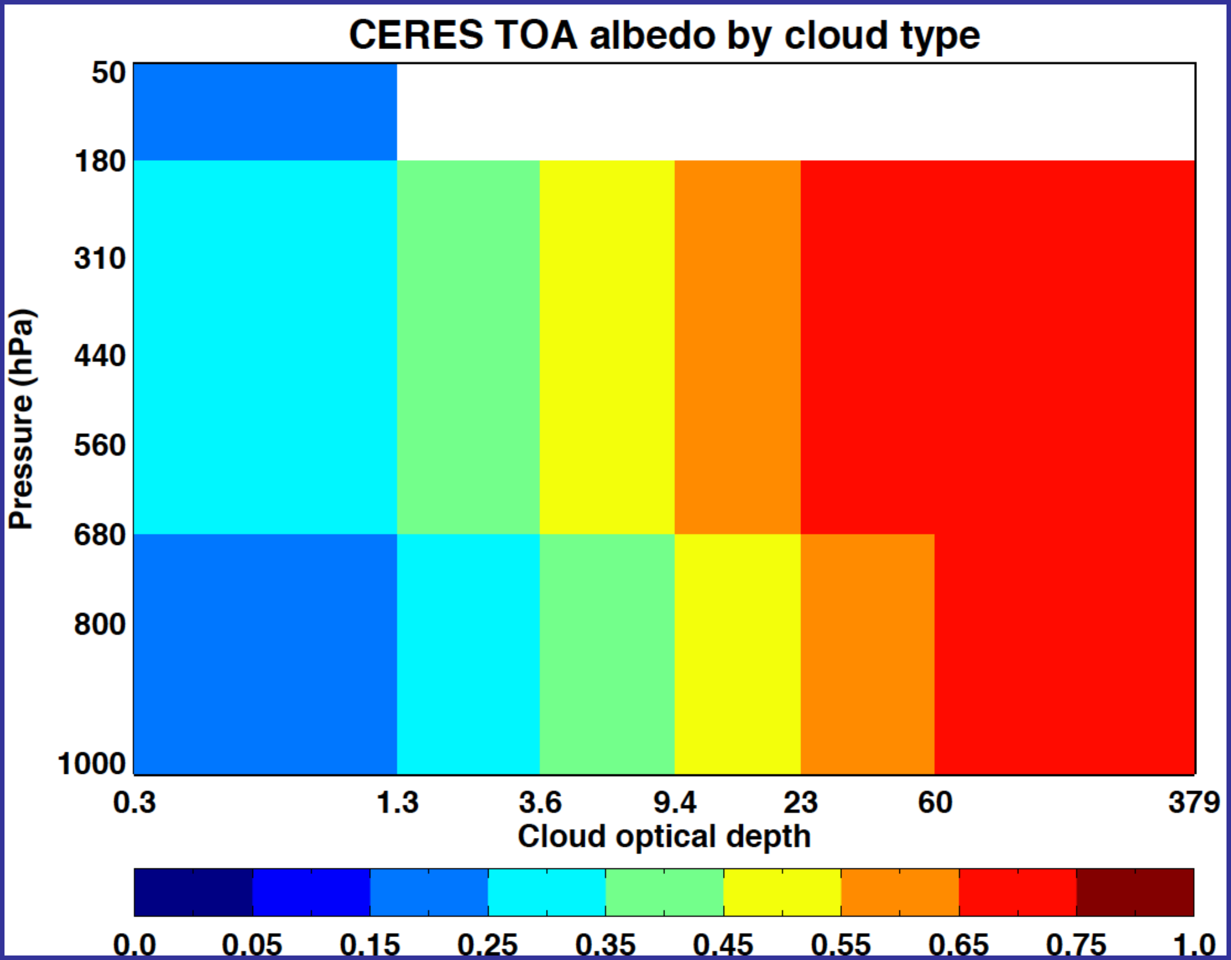
Newer Results: SGP

- Observed clear fraction: 0.4612126
- Simulated clear fraction: 0.482
- Observed all-sky OLR: 231.1
- Simulated all-sky OLR: 236.7 (normalized: 240.3)
- Observed clear-sky OLR: 259.3
- Simulated clear-sky OLR: 270.6 (normalized: 272.3)
- Observed all-sky TOA albedo: 0.367
- Simulated all-sky TOA albedo: 0.333 (normalized: 0.330)
- Observed clear-sky TOA albedo: 0.204
- Simulated clear-sky TOA albedo: 0.164 (normalized: 0.159)

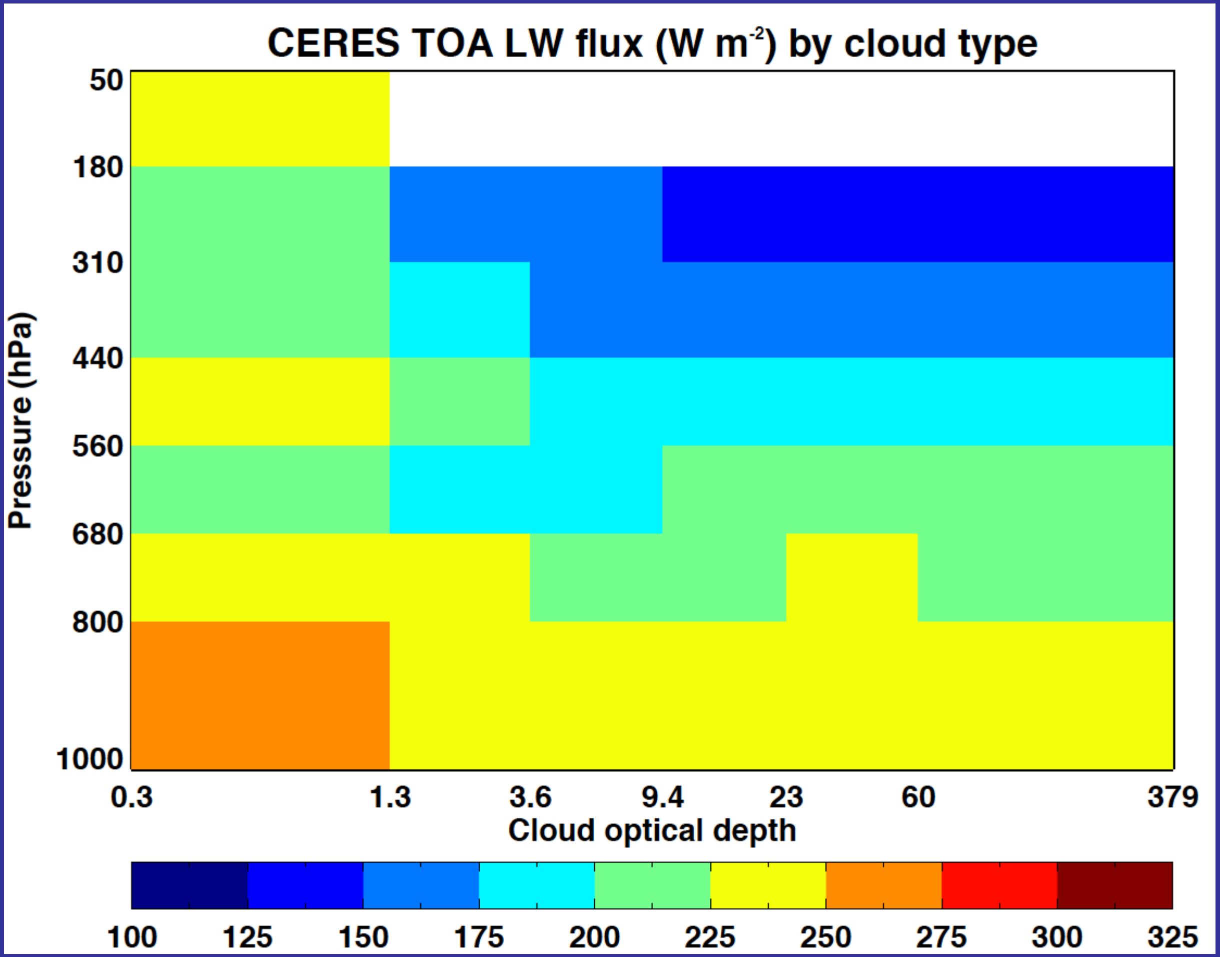
CERES FBCT Cloud Occurrence



CERES SW albedo by cloud type



CERES OLR by cloud type



Future Plans

- Convert input for Langley Fu-Liou model to direct input.
- Possibly normalize fluxes by using model grid cell fluxes.